Available online at www.sciencedirect.com

ScienceDirect

Procedia Social and Behavioral Sciences 15 (2011) 3222–3226

Procedia Social and Behavioral Sciences

WCES-2011

Aligning large-scale examinations to the curriculum guidelines: student selection examination and Turkish biology curriculum

Salih Çepni [a], Yilmaz Kara[b]*

[a,b] *Fatih Education Faculty, Karadeniz Technical University, Trabzon, 61335, Turkey*

Abstract

This study presents findings retrieved from an analysis of the Turkish Biology Curriculum Guidelines and it's the alignment to the Student Selection Examination (SSE). Webb's (2007) alignment criteria were used to investigate relationship among guidelines and assessment. In this process, biology questions of SSE were examined in detail with ten biology teachers. The results showed that although alignment consistency was high according to the depth-of-knowledge consistency and categorical concurrence criterions, the SSE questions and curriculum outcomes were not fully aligned considering low consistency of range of knowledge and balance of representation criterions. Consequently, validity and reliability of the examination for higher education eligibility need to be increased starting from analysis the contents areas and the nature of questions.

Keywords: Curriculum guidelines; validity/reliability; program evaluation; science education; standards.

1. Introduction

During the last decade, realization of precollege education reform movement occupies the first rows of Turkey's education agenda, including the development of secondary school biology education curricula and associated instructional materials (MONE, 2009). The efforts for nationwide expansion and implementation were contemplated and are currently underway, after small-scale piloting of new instructional resources. With the renewal of curricula, structure of central examinations also expected to be modified due to greatly benefiting from the assessment frameworks defined in the curriculum (Liu & Fulmer, 2008; Nasstrom & Henriksson, 2008; Vos & Bos, 2005). SSE point which is a standardized test score has been considered to decide which student is eligible for what kind of higher education program (SSPC, 2009). Indeed, all these and other indicators resembling the degree of student gaining's described in national educational curricular documents, although the main purpose of the standardized tests is not assessing the high school curricula (Fensham, 2009; Hatzinikita, 2008; Nentwig et al, 2009; Sadler & Zeidler, 2009). In this way, the present study aimed to investigate alignments of the SSE questions with the contents and standards of the curriculum. For this study, specifically biology questions posed at the 2009 SSE booklets were analyzed with respect to standards of 2008 biology teaching program for 9^{th}-12^{th} graders covering cognitive objectives and Science, Technology, Society, Environment (STSE), Scientific Research and Scientific Process Skills (SRPS), and Communication Competencies, Attitudes, and Values (CCAV) behaviors.

* Yilmaz Kara. Tel.: +90-538-461-0157; fax: +90-462-248-7344.
E-mail address: yilmazkaankara@yahoo.com

1877–0428 © 2011 Published by Elsevier Ltd. Open access under CC BY-NC-ND license.
doi:10.1016/j.sbspro.2011.04.275

1.1. The 2008 Secondary Education 9th-12th Grade Biology Lesson Teaching Program

The program is composed of units that comprise the objectives directed to concept, principle, theory and objectives directed to competence, comprehension, attitude, value. The fundamental concepts in units related to "Cell, Organism, and Metabolism", "Biologic Diversity, Genetic, and Evolution", and "Environment and Human" in 9th through 12th grades are reflected to subject content in parallel with public to specific, well known to unknown principles as required by spiral approach . Behaviors related to competence, attitude, value, and comprehension are mentioned under STSE, SRPS, and CCAV (PTTB, 2008).

2. Methodology

In order to investigate the conformity between standards and questions, semi structured interviews were conducted with forty biology teachers (60% female) working at secondary schools in the central part of the Trabzon province in Turkey. All the interviewees were experienced biology teachers with around ten years teaching experience. School practitioners whose insight on the processes and outcomes of curriculum are among the most important of all stakeholders, recommended to complete following five steps; **Relate** class, unit, standard, and objective with each question, **Identify** the degree of convenience as compatible, partially compatible, and weekly compatible between each of biology questions and the related objective along with the indicated science, technology, society, environment, scientific research and scientific process skills, and communication competencies, attitudes, and values if it is provided, **State** the degree of questions' cognitive levels with respect to related outcomes as below, equal, and above, **Explain** which sort of content, skills and objectives are necessary to solve biology questions, **Identify** relation of the biology question with which of the related objective(s) under the standard. All interviews were briefly noted and transcribed verbatim for analysis. The collected data were analyzed according to criterions of Webb (2007) alignment analyze model.

3. Findings

3.1. Criterion 1: Question Analysis for Categorical Concurrence

For this criterion, the reviewers firstly examined the questions and then they specifically concentrated on the objectives of each standard which directly related to the SSE biology questions.

Table 1 Categorical concurrence of the SSE biology questions and the standards for "Cell, Organism, and Metabolism" learning area.

Questions	Grade	Standards	Inter Coder Reliability	Categorical Concurrence
Sci-1-21	9	Standard 1 Objective 1.2	IR=0.9	YES
Sci-1-22	9	Standard 1 Objective 1.2	IR=0.9	YES
Sci-1-23	9	Standard 1 Objective 1.4	IR=0.5	NO
Sci-1-24	11	Standard 2 Objective 2.1-2.2	IR=0.7	YES
Sci-1-25	11	Standard 5 Objective 5.2	IR=0.8	YES
Sci-2-21	10	Standard 1 Objective 1.6 Standard 2 Objective 2.8	IR=0.7	YES
Sci-2-22	11	Standard 5 Objective 5.3	IR=0.8	YES
Sci-2-24	12	Standard 6 Objective 6.7	IR=0.8	YES
Sci-2-25	12	Standard 6 Objective 6.11	IR=0.4	NO
Sci-2-26	12	Standard 6 Objective 6.11	IR=0.9	YES

All reviewers provided hits for all of the questions as seen in Table 1. From the results, we can conclude that the content of examined SSE questions mostly were met with a high agreement coefficient only for the related objectives sorted along with the standards but because of limited number of biology questions asked in SSE is distant from covering all of the standards.

3.2. Criterion 2: Question Analysis for DOK Consistency

The objectives sorted with the standards for "Cell, Organism, and Metabolism" learning area were compared with the SSE questions on the bases of the complexity of knowledge required by each part to fulfill this criterion. DOK consistency of the SSE biology questions for the biology teaching program objectives in terms of cognitive dimension were materialized.

Table 2 Analysis of the SSE biology questions according to curriculum objectives for Cognitive Domains

Chapter	Standard	Level	Question	Level	Teacher Opinion			DOK Cons.
					Under	At	Above	
Cell, organism, and metabolism	Standard 1.2	Remember	Sci-1-21	Understand	2/10	3/10	5/10	No
	Standard 1.2	Remember	Sci-1-22	Understand	5/10		5/10	No
	Standard 1.4	Understand	Sci-1-23	Understand		9/10	1/10	Yes
Energy conversion in living things	Standard 1.6	Understand	Sci-2-21	Understand	1/10	7/10	2/10	Yes
Plant biology	Standard 2.1-2.2	Understand	Sci-1-24	Understand		10/10		Yes
	Standard 5.2	Understand	Sci-1-25	Understand		5/10	5/10	Yes
	Standard 5.3	Understand	Sci-2-22	Remember	2/10	6/10	2/10	Yes
Animal biology and human	Standard 6.7	Understand	Sci-2-24	Understand	2/10	6/10	2/10	Yes
	Standard 611	Understand	Sci-2-25	Understand	3/10	2/10	5/10	No
	Standard 6.10	Understand	Sci-2-26	Understand	2/10	8/10		Yes

Table 2 shows DOK consistency of the cognitive level of the questions with the objectives along with the standards. A big majority of the questions' cognitive levels are marked as suitable for the cognitive levels of the objectives along with the standards. Exactly, 90 % percent of the questions belong to the understanding levels of the revised taxonomy. From these findings, we could say that on the basis of the complexity of knowledge demanding cognitively by the objectives along with the standards and the SSE questions were close to each other. Therefore, DOK Consistency of the seven questions was hit as YES.

3.3. Criterion 3: Question Analysis for Range of Knowledge Correspondence

In this process, each reviewer examined the SSE biology questions and write down what types of knowledge or abilities students should be able to know to solve these questions and what kind of objective(s) along with the standard is able to be given to the students.

Table 3 Mean percentage of total objectives for the "Cell, Organism, and Metabolism" learning area for Range of Knowledge

Question	Qualitative Assessments of the Results from the Comparisons	%	Decision
Sci-1-21	Objective mainly focused on organic and inorganic compounds in the body of biological organism. Without understanding the anabolic and catabolic reaction mechanisms in other words chemical conversions of organic and inorganic compounds it is not possible to solve the problem.	10	No
Sci-1-22	Solution of the problem requires comprehensive knowledge about enzymes. Question try to investigate enzyme concept, structure, and reaction mechanism understood with its results by students. Objective was remained too shallow for the question.	20	No
Sci-1-23	Question investigates structures and functions of organelles over a sample that foresight gaining tree dimension, becoming ready for action, and transport to the area of usage in a cell stages of a polypeptide chain to secretion instead of a cell model. Although question constructed over an abstract sample that occurs in a cell, knowing protein synthesis mechanism is clearly facilitate the solution of the question as upper information.	40	Weakly Met
Sci-1-24	Question probing water transport in plants through radioactively signed hydrogen atom included water sample and transport of photosynthesis products through a polysaccharide sucrose met in fruit sample. Thus, students only need to summarize transport processes in plants through the abstract samples in addition to awareness of transport mechanism.	70	Yes
Sci-1-25	Samples of reproduction adaptations in entomophilies listed at the answer choices by giving focus on pollination in flowering plants with a slight mention on adaptation concept in addition to pollination. Question neither requires any figure or model impression nor verbal or written summarization.	60	Yes

Sci-2-21	Students enables to compare ways of energy production in living organisms over muscle cells that can make oxidative phosphorylation like other somatic cells in case of oxygen existence and lactic acid fermentation in case of oxygen debt, and facultative anaerobe bacteria that can live in either the presence and absence of oxygen.	80	Yes
Sci-2-22	Cases occurring in flowering plants randomly enumerated starting from arrival of pollen to the stigma until formation of endosperm tissue at the choices of this question. Students can easily find true answer if they achieve to recall their knowledge about fertilization in flowering plants. Question neither requires any model impression nor verbal or written summarization.	70	Yes
Sci-2-24	Cognitive objective mainly focused on stimuli acceptance and transport procedures in sense organ. But, question investigates awareness of a specific feature of these organs called "neural adaptation" over real life situations like "taste sense reduces when you get flu".	40	Weakly Met
Sci-2-25	The question asked with the aim to investigate regulatory system's supervision on respiratory system. Students expected to make comparisons and choose the sample of this kind of supervision sample among real life situations listed at the choices of this question. But given samples also required to know function and structure of circulatory, respiratory and neural system.	10	No
Sci-2-26	Whether the students explain the regulation of hormone secretion through positive and negative feedback was aimed to investigate by asking this question. From this point of view question and cognitive objective seems to be convenient. But students also need to know factors that can affect blood pressure. There is not any attribution to models, benefiting from different sources, or computer simulations the stated in STSE and SRPS behaviors along with the cognitive objective.	40	Weakly Met

From the Table 3, it can be seen that within ten questions belongs to "Cell, Organism, and Metabolism" learning area, only four questions have acceptable knowledge correspondence about related objectives along with the standards. Reviewer explanations about objectives and questions provided rich qualitative data in the area of Knowledge Correspondence. Moreover, reviewers evaluated the degree of compliance for each question to support their explanations. Acceptable knowledge correspondences were observed only for four questions as "YES". From these findings, we could say that a comparable span of knowledge expected of students by the objectives along with the standards for the teaching program is not the same or correspondent to the span of knowledge that students need to correctly answer the SSE questions.

3.4. Criterion 4: Question Analysis for Balance of Representation

From the Table 4, only three questions could be classified into the acceptable category for balance of representation criterion. This criterion show that SSE questions were not distributed equally within objectives listed below the standards. It means that some objectives were given more emphasis on the SSE questions than others. Therefore, many standards were ignored and acceptable balances were not established.

Table 4 Balance Index of SSE Biology Questions for Structure and the Properties of Matter Unit

Chapter	Objective	Question Number	Balance Index	Balance of Representation
Cell, organism, and metabolism	**1.2.**	Sci-1-21	**BI= 0.4**	No
Cell, organism, and metabolism	**1.2.**	Sci-1-22	**BI= 0.4**	No
Cell, organism, and metabolism	**1.4.**	Sci-1-23	**BI= 0.3**	No
Plant biology	**2.1. 2.2.**	Sci-1-24	**BI= 0.67**	Weak
Plant biology	**5.2.**	Sci-1-25	**BI= 0.79**	Acceptable
Energy conversion in living things	**1.6.**	Sci-2-21	**BI= 0.2**	No
Plant biology	**5.3.**	Sci-2-22	**BI= 0.71**	Acceptable
Animal biology and human	**6.7.**	Sci-2-24	**BI= 0.68**	Weak
Animal biology and human	**6.11.**	Sci-2-25	**BI= 0.59**	No
Animal biology and human	**6.10.**.	Sci-2-26	**BI= 0.73**	Acceptable

4. Discussions and Conclusions

Superficial assessment results obtained through the analysis for the SSE questions during this study indicated that the outcomes of teaching program had a consistency with the SSE questions. Based on these results, all decision and policy makers argue that the current SSE is valid and reliable and at the same time it reflects to the nature of the

current Biology Curriculum. However, when the SSE was analyzed by using four alignment criteria, it was found that the questions only fulfil the first two criterions and not the rest which of investigate the depth relationships among the curriculum and questions. In this case, there is a strong need for the assessment of entire SSE questions included all subjects and tests to reach to the stronger conclusions (Saderholm & Tretter, 2008; Liang & Yuan, 2008; Liu & Fulmer, 2008).

The secondary education of developing countries has been largely dominated by a preoccupation with preparing students for admission to institutions of higher education. Teaching is thus largely geared toward covering content and helping students develop the cognitive problem solving skills that are perceived to be necessary to pass the high stakes university entrance exams, which usually weight content heavily. Given the preoccupation with covering the content in textbooks—as dictated by the exam culture and by the expectations of parents and administrators—teachers find that there is little time available to address other domains of the biology curriculum. This exam driven atmosphere, in which parents perceive that gaining access to universities is a way for their children to climb the social and economic ladders, puts tremendous pressure on schools, administrators, and teachers to focus on what is needed to succeed in competitive university entrance exams. This pressure causes to prefer rather traditional curricular and pedagogical applications in classrooms (Kjellström & Pettersson, 2005).

Finally, it could be concluded that validity and reliability of the examination for higher education eligibility need to be increased regarding the findings and discussions. In order to meet this need, the policy makers should firstly analyze the contents and the nature of questions asked in the central examinations. Secondly, in order to become successful at international examination, all educators and researchers should be aware of the fact that new biology teaching program should include the concepts of scientific literacy, nature of science, basic science concepts, the relationships between science, technology, society and environment and the reflections of fundamental behaviors of SRPS, STSE and CCAV in practice. If students grasp all these acquirements, they will be very successful at the central examinations in addition to use the knowledge in solving daily life problems. Theoretically, this might sound possible but how it could be put all these advance ideas and attainments into practice will remain as the main problem which must be dealt with in the near future.

References

Fensham, P. J. (2009). Real world contexts in PISA science: Implications for context-based science education. Journal of Research in Science Teaching, 46 (8), 884–896.

Hatzinikita, V., Dimopoulos, K., Christidou V. (2008). PISA test items and school textbooks related to science: A textual comparison. Science Education, 92 (4), 664 – 687.

Kjellström, K. & Pettersson, A. (2005). The curriculum's view of knowledge transferred to national tests in mathematics in Sweden. International Journal on Mathematics Education ZDM, 37(4), 308-316.

Liang, L.L. and Yuan, H. (2008). Examining the alignment of Chinese national physics curriculum guidelines and 12th grade exit examinations: A case study. International Journal of Science Education, 30(13), 1823 – 1835.

Liu, X., Fulmer, G. (2008). Alignment between the science curriculum and assessment in selected NY state regents' exams. Journal of Science Education and Technology, 17 (4), 373–383.

MoNE (2009). National education statistics formal education 2008- 2009. Strategy Development Presidency Department of Publications, Ankara.

Nasstrom, G. Henriksson, W. (2008). Alignment of standards and assessment: A theoretical and empirical study of methods for alignment. Electronic Journal of Research in Educational Psychology, 6 (3), 667-690.

Nentwig, P., Roennebeck, S., & Schoeps, K. (2009). Performance and levels of contextualization in a selection of OECD countries in PISA 2006. Journal of Research in Science Teaching, 46 (8), 897–908.

PTTB (2008). 9th-12th grade biology course teaching program, MoNE, Ankara, Turkey.

Saderholm, J. C., Tretter, T. R. (2008). Identification of the most critical content knowledge base for middle school science teachers. Journal Science Teacher Education, 19(3), 269–283.

Sadler, T.D., Zeidler, D.L. (2009). Scientific literacy, PISA, and socioscientific discourse: Assessment for progressive aims of science education. Journal of Research in Science Teaching, 46 (8), 909–921.

SSPC (2009). 2009 Student selection and placement system guide. Meteksan Co. Ankara.

Vos, P., Bos, K. (2005). The mathematics curriculum in the Netherlands: Measuring curricular alignment using TIMSS-99. Educational Research and Evaluation, 11 (2), 201– 219.

Webb, N. L. (2007). Issues related to judging the alignment of curriculum standards and assessments. Applied Measurement in Education, 20(1), 7–25.